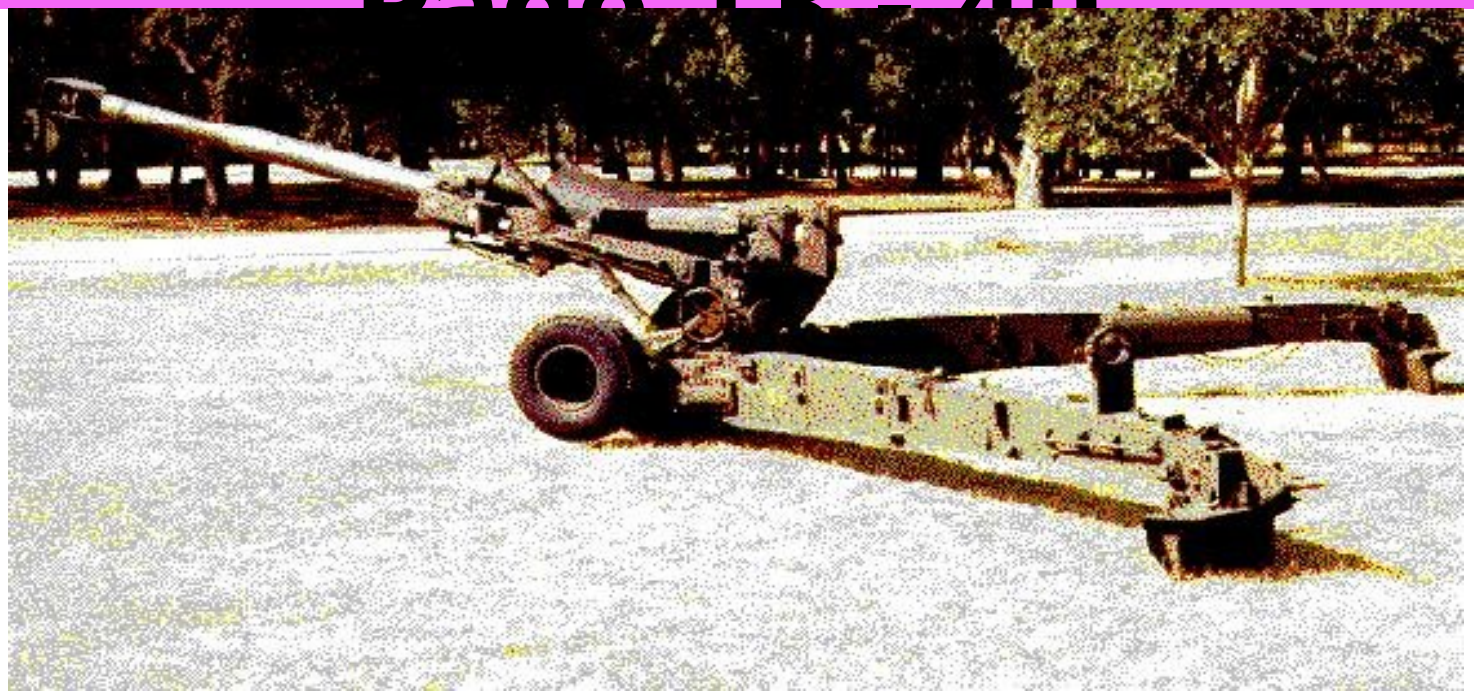
# Manual Special Munitions

- **PE BOOK Page # 77**

- **The Objective: TO DETERMINE MANUAL DATA FOR SPECIAL MUNITION PROJECTILES**

# Manual Special Munitions

## Improved Conventional Munitions
## Page 13 - 40



# Improved Conventional Munitions

- **A projectile that base ejects sub-munitions (grenades) over the target area.**
- **These grenades contain shaped charges capable of penetrating light armor and provides for anti-personnel fragmentation.**

- **Three ICM projectiles are provided for the 155 mm howitzer.**

- **M449A1 - APICM - 60 M43 (anti-personnel) grenades.**

- **M483A1 - DPICM - (Dual Purpose) - 64 M42 and 24 M46 grenades. The M46 are scored to provide anti-personnel fragmentation.**

- **M864 - Base Burn - 48 M42 and 24 M46 grenades.**

# Characteristic of an ICM Projectile

- **The Trajectory to the target is a two-part trajectory.**
- **Ballistic trajectory from the muzzle to sub-munitions expulsion over the target.**
- **Free Fall of sub-munitions to the target.**

- **MANUAL computations require computation of data for a base projectile and extraction of firing data from addendum’s or the secondary GFT scales.**

- **The empty projectile case will continue to follow a ballistic trajectory past the target and could prove to be a hazard to friendly elements operating down range.**

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- **Manual ICM Computations**
  - **It must be noted that M483A1 (DPICM) currently forms the base projectile for a family of projectiles: TFT, (FT 155 AN-2).**
  - **The AN-2 provides data when fired in the self-registering mode (as a bursting round for adjustment and registration).**
  - **This TFT provides the base data for M483A1, which then must be converted to a casualty producing air-burst with data from the addendum J-1.**
  - **To avoid the adjustment of fire with the DPICM round, the ballistic research laboratory created the FT 155 ADD-R-2. An addendum to the M107 AM-2 TFT.**
  - **The R-2 Addendum allows the user to adjust with HE (a ballistically dissimilar round) and fire for effect with DPICM.**
  - **The AN-2 technique is still valid, however the R-2 technique is preferred because of the savings in ammunition and accurate muzzle velocities on which the newer addendum was based.**

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# Three Ways to Compute DPICM Firing Data.

- **First Way: 155-AM-2 GFT with ICM Scales and a GFT Setting.**
- **OR with a 155-AN-2 GFT with ICM Scales and a GFT Setting.**

- **Second way: 155-AM-2 GFT and Addendum R-2**
  **OR with a FT 155-AM-2 and Addendum R-2.**

- **Third way: 155-AN-2 GFT / FT 155-AN-2 and Addendum J-1.**

- **Preferred Way: 155-AM-2 GFT with GFT Setting and Addendum R-2.**

- **ROF**

# Manual Special Munitions

# ILLUMINATION

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# USES OF ILLUMINATION

- **Illumination of areas of suspected enemy movement**
- **Provides illumination for night adjustments or the surveillance of artillery fire.**
- **Harass enemy positions or installations.**
- **Can provide direction for friendly troops for an attack or patrolling activities.**
- **Guide low level tactical bombers onto important targets (MARK).**
- **Furnish visibility for direct fire weapons. (FPF)**

# CHARACTERISTICS OF ILLUMINATION

- **Illumination can provide friendly forces with enough light to assist them in ground operations at night.**
- **This facilitates operations for both the forward observers and the maneuver unit.**

- **There are several techniques available that can be used in determining data for illumination fire missions.**
- **The particular technique used and basis for corrections are based on the employment considerations made by the FDO/OPS Chief.**

# ILLUMINATION PROJECTILES

- **Illumination projectiles are available for the 105-mm and the 155-mm howitzers.**
- **Illumination projectiles for both weapon systems are base ejecting projectiles and are fired with a mechanical time (MT) fuze.**
- **The filler consists of illuminating canister and a parachute assembly.**

- **Additionally, since they are designed to illuminate a large area the illumination projectiles are not weight zoned.**

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# PROJECTILES

## 155-MM PROJECTILES:

- **The M485A2 projectile provides 1,000,000 candlepower of illumination for 120 seconds.**
- **Considered sufficient to illuminate a circle 1000 meters in diameter.**
- **The M485 Series Illumination Projectiles expels the Illuminate candle, which lights approximately 7 Seconds later.**
- **The TFT AM-2 provides the firing data for the 600 meter height of burst, described in the TFT as the HOB (Height of Burst) for the illumination ignition .**
- **Approximate rate of fall is 5 meters per second.**

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## FUZES

- **Illumination is a base-ejecting projectile that requires a fuze that makes the projectile expel its payload over the target area by mechanical time action.**
- **Two fuzes that perform this action are:**
- **M565 Mechanical Time**
- **M577 Mechanical Time Super Quick.**
- **Since the M565 is an older fuze and no longer in production we will determine data using the M577 fuze.**

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# EMPLOYMENT CONSIDERATIONS

- **The Operations Chief should select the lowest practical charge to prevent the malfunction of a ripped parachute, caused when the flare is ejected from the projectile.**
- **Illumination GFT's for the AM-2 are only available for charges 2 ,3 & 5 GB, and 7 WB at low angle.**
- **Illumination data is available for both low and high angles in the TFT for all charges.**
- **The observer uses the criteria in his Call For Fire for the amount of illumination to be used during a particular mission.**
- **These criteria depends on the distance, condition of visibility, the size, width and depth of the area to be illuminated.**

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# ILLUMINATION PATTERNS

- **Based on the FDO/OPS Chief considerations and an observers request, illumination missions are conducted using one of several techniques.**
- **These techniques involve firing a certain pattern of illumination best suited to meet the needs of the tactical situation.**

# ONE GUN ILLUMINATION

- **This is used when effective illumination can be accomplished by firing one round at a time.**
- **The observer may adjust the illumination for location and height of burst.**
- **He can then stay with one-gun illumination in a coordinated illumination mission.**
- **Example;**

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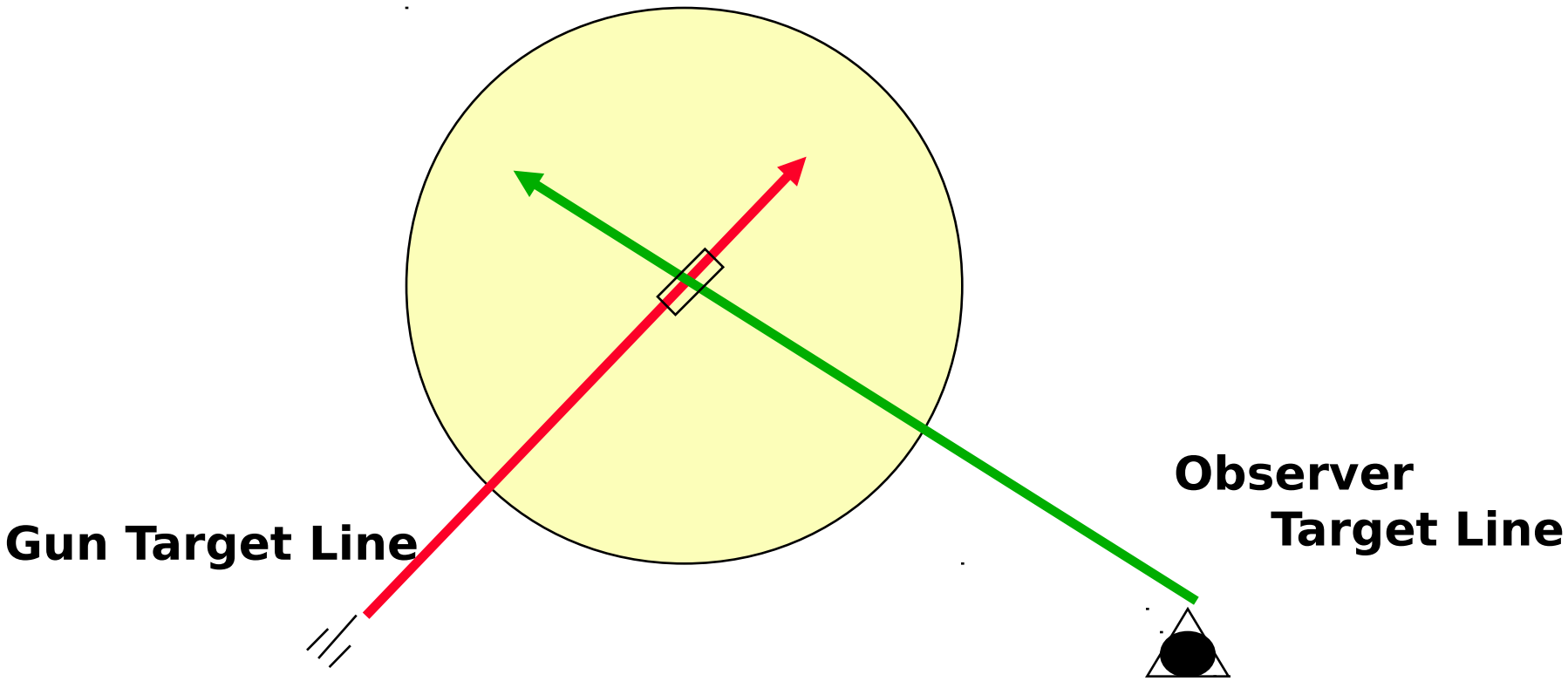
## ONE GUN ILLUMINATION



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## TWO GUN ILLUMINATION

- **When an area requires more illumination then a one-gun illumination mission can provide (due to extreme range, fog or low visibly, or a large size target).**
- **This technique may be fired with or without any adjustments of the one-gun illumination data.**

- **Example**

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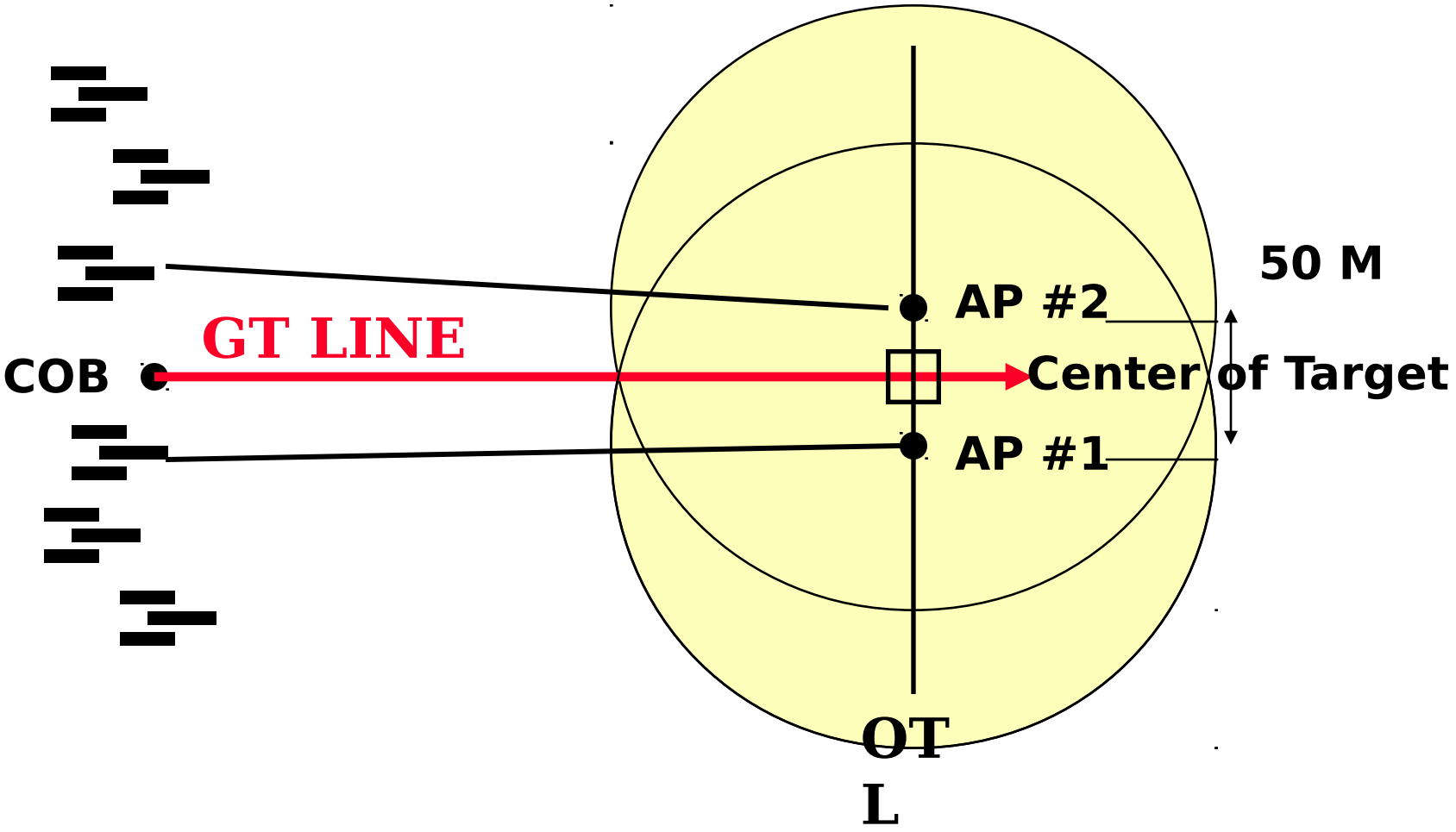
## TWO GUN ILLUMINATION

**(due to fog or low visibility)**



# TWO GUN ILLUMINATION

**With the use of a patterns with the spread size of:**

- **500 meters for 155mm howitzers.**
- **There are two patterns for two-gun illumination.**
- **Example**

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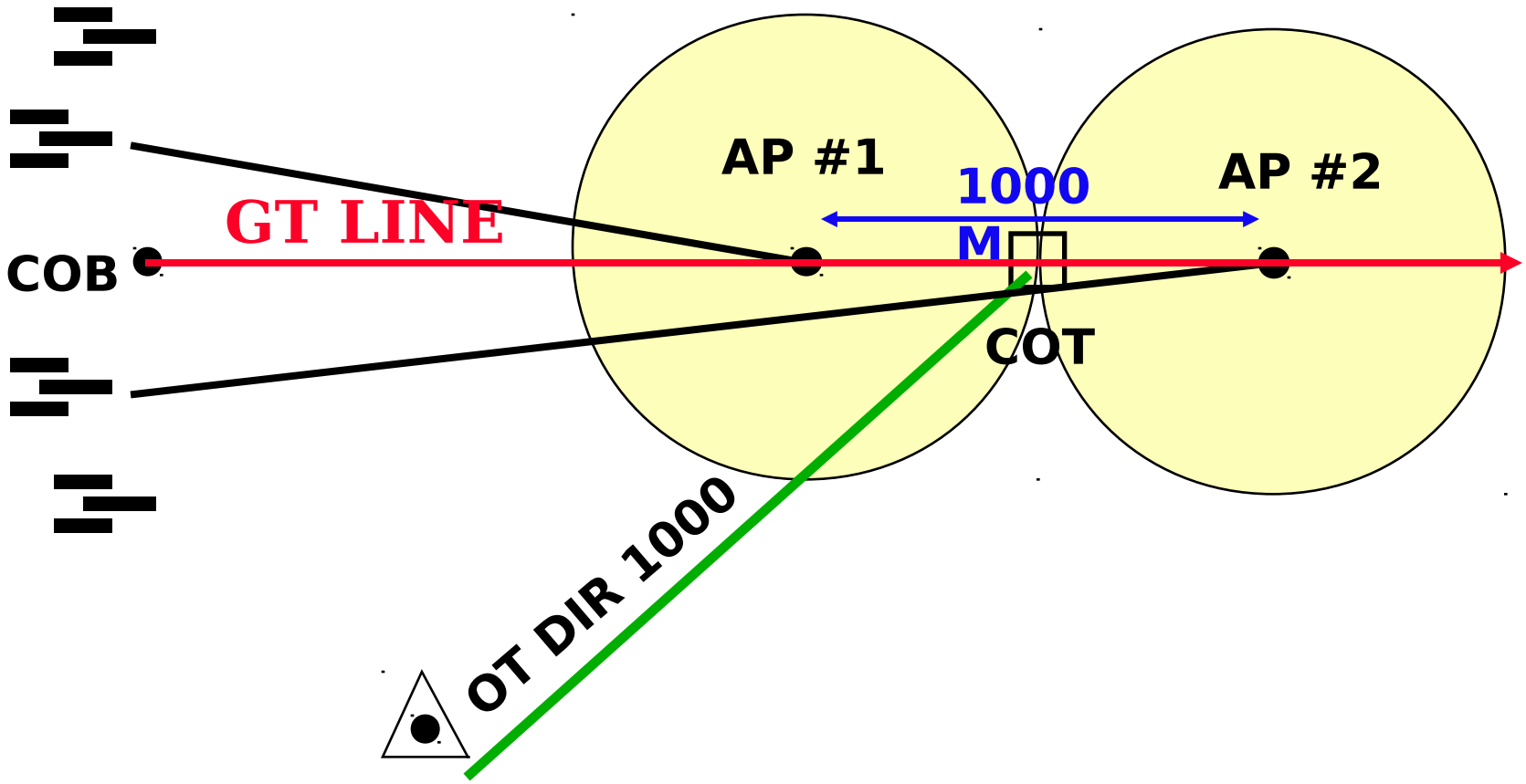
## RANGE SPREAD

- **Employed when the area has a greater depth then width.**
- **Normally fired using the gun-target (GT) line with correction's made in the Quadrant Elevation (QE) and fuze settings.**
- **Using the GT line is more responsive in speed.**
- **However, it may not always provide the best coverage since the observer may not be able to visualize the GT line.**
- **He may desire to use the Observer-Target (OT) line. Then the HCO would plot the individual aim-points.**
- **Each gun firing will fire individual data. (Spec Corr)**

# Manual Special Munitions

## RANGE SPREAD



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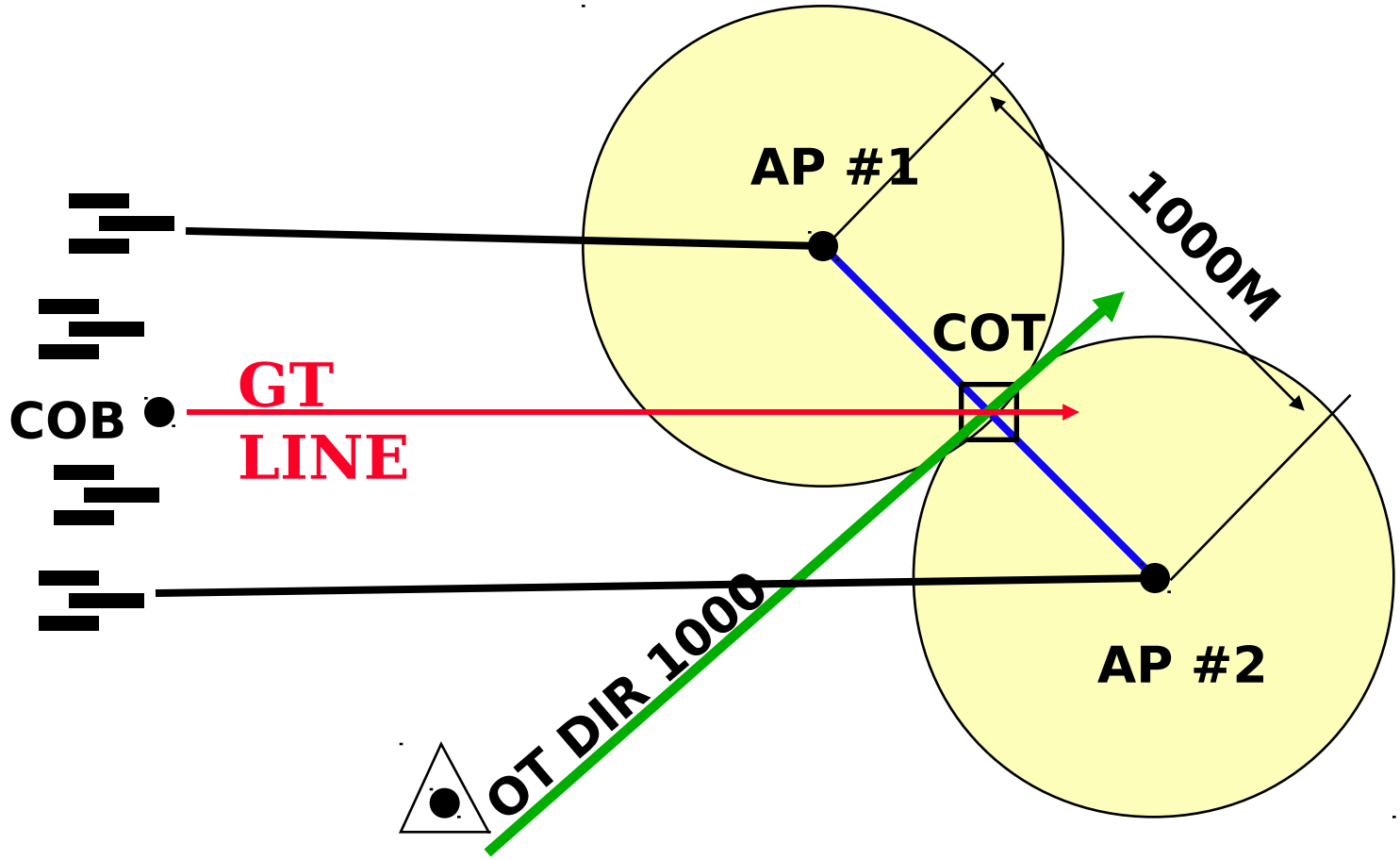
## LATERAL SPREAD

- **Employed when the area has a greater width then depth.**
- **Normally fired using the gun-target (GT) line with correction's made in deflection.**
- **Again, the use of the GT line may be more responsive in speed to the observer's need, but may not always provide the best illumination coverage desired since the observer may not be able to visualize the GT line.**
- **He may use his observer-target (OT) line.  In this case the HCO would plot the individual aim-points.**
- **Each gun firing will each have individual data.**

# Manual Special Munitions

# TWO GUN ILLUMINATION LATERAL SPREAD



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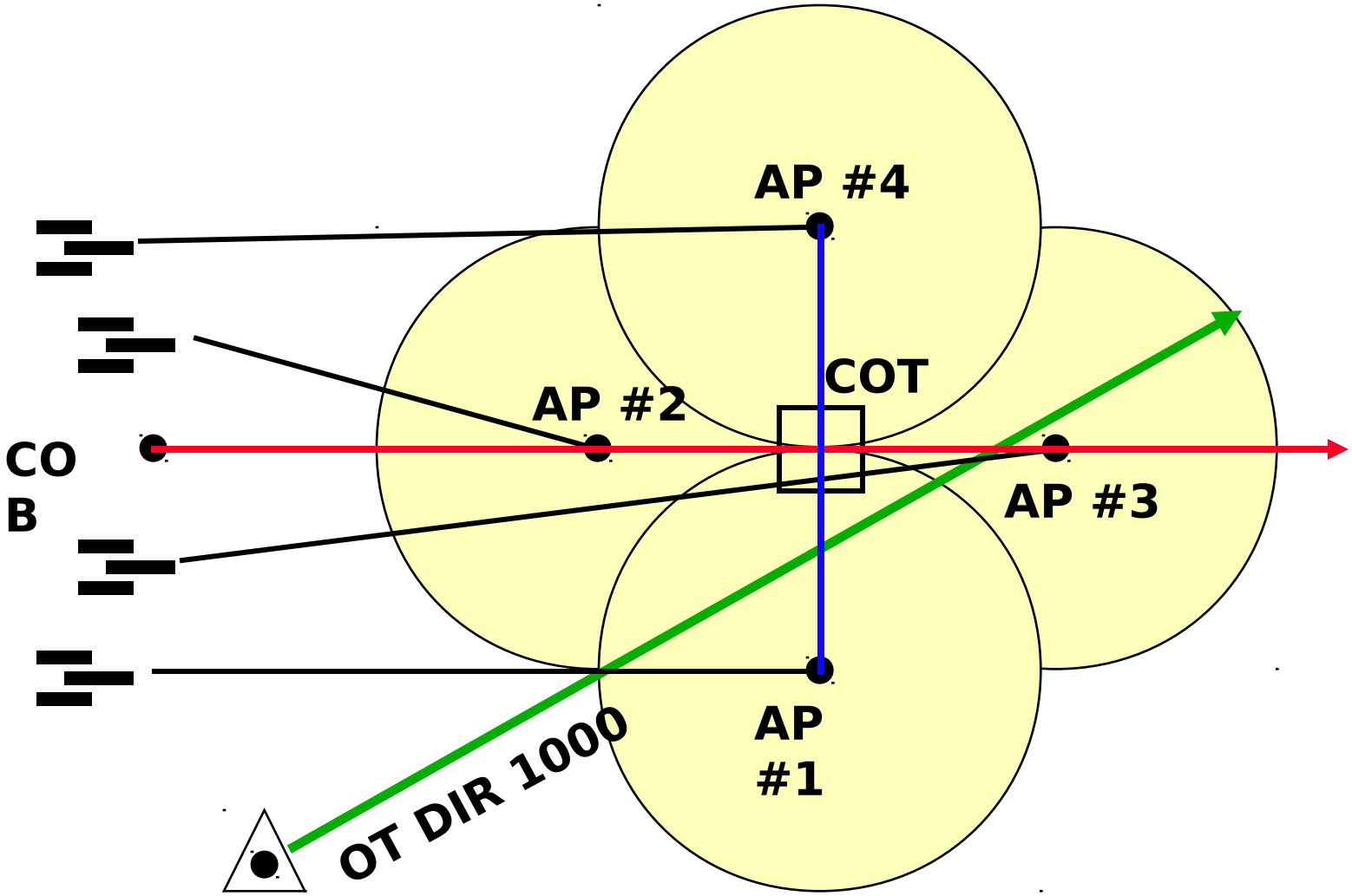
## FOUR GUN ILLUMINATION

- **Used when an area requires more illumination than can be furnished by one or two-gun illumination.**
- **This pattern is also commonly referred to as a Range and Lateral spread.**
- **When computed manually, this pattern combines both the two-gun range and lateral spread fired simultaneously.**
- **Each gun firing will have individual data.**

# Manual Special Munitions

## FOUR GUN ILLUMINATION

## RANGE & LATERAL SPREAD



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## ILLUMINATION GFT

- **Available as a source for illumination firing data and are only available for charges 2GB, 3GB, 5GB and 7WB.**
- **If the FDO/OPS Chief wanted to fire a GFT available charge, the GFT would be used as the primary means of determining data. This allows the computer to apply the data from TBL A without the delay incurred by the use of the TFT.**
- **The first line of labeling indicates the projectile of the GFT: PROJECTILE ILLUMINATING.**
- **The second line identifies the TFT and projectile: 155AM2M485**
- **The third line specifies the weapon: HOW 155mm**
- **The Last line on the label indicates the charge: CHG 2 GB**

# ILLUMINATION GFT Scales

- **100/R Scale** is printed in red along the top edge of GFT. It denotes the number of mils necessary to shift the burst 100 meters laterally or vertically at a given range. **Accuracy 1 mil.**
- **RANGE Scale** is the base scale of the GFT. All other scales are plotted with reference to this scale. The scale is a logarithmic scale similar to the scales on other GFT's. **Accuracy of 10 meters.**
- **ELEVATION TO IMPACT Scale** are graduated in mils and used to determine the range (on the range scale) to which a non-functioning projectile will impact.
- **HEIGHT OF BURST Scales** provide data for heights of burst 350 to 850 meters **above the gun, not the target.** The scales are in 50 meter changes in Height of Burst. To select the desired height of burst scale will depend on the vertical interval.

# ILLUMINATION GFT Scales

- **QUADRANT Scale is shown for each listed HOB and gives the QE necessary to achieve that HOB at the desired range.**
- **It is graduated across the top of the line in 5 mil graduations and are numbered every 50 mils. Determined to the accuracy of 1 mil. Visually interpolate when required.**

- **NOTICE that there are two 580 graduations on the 600 HOB line. This represents that the trajectory is flat enough to not change in height by more than 50 meters.**

# ILLUMINATION GFT Scales

- **FUZE SETTING Scale provides the FS to achieve the desired HOB at a given range and consists of a series of red arcs.**
- **The scale includes a red line for each whole FS graduation for the M565 MT fuze. The value for each line is printed in red at the bottom of the scale.**
- **The FS values occur where the MHL crosses the determined HOB line.**
- **The FS is read for the desired range and height of burst to the accuracy of 0.1, Visually interpolate when required.**

- **ROF**

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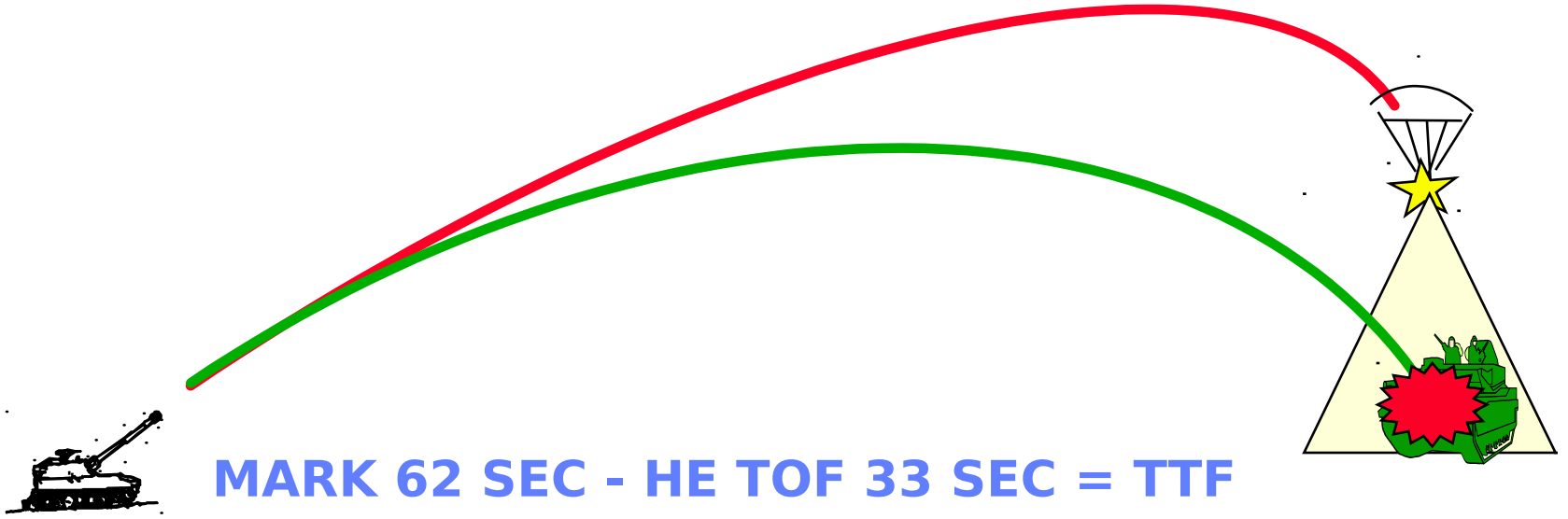
## COORDINATED ILLUMINATION



MARK 62 SEC - HE TOF 33 SEC = TTF 29 SEC

- **Observer transmits the Call for Fire.**
- **FDC fires the Illumination and starts the timer - “ILLUMINATION MARK” is transmitted by the Observer when the target area is best illuminated.**
- **The Total Elapsed Time is called the MARK TIME.**
- **The FDC will determine the HE TOF and add a 5 Second Reaction time.**
- **Subtract that time from the MARK TIME to determine the TIME TO FIRE (TTF).**

# Manual Special Munitions

# ROCKET ASSISTED PROJECTILE (RAP)
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# RAP Manual Computations

- **Procedures for computing HE RAP firing data are identical to those for conventional projectiles.**
- **The RAP, TFT, GFT, and GST (FT 155MM AO-1) are similar to and data is determined in the same way as for conventional HE projectiles with one exception.**
- **The 155mm M549A1 has no fuze setting scale.**
  **(Due to the high probable height of burst errors)**

- **NOTE: The use of Propellant M119 with the M549/549A1 may cause the rocket motor to fail to function.**

# RAP Registration and Determination of a GFT Setting

- **In a combat environment, the unit may conduct registrations (as a Mean Point of Impact) for at least one weapon in each firing unit.**
- **The GFT setting determined will provide increased accuracy in the firing of the rocket assisted projectile.**
- **Also a Concurrent Met solved with the determination of a GFT setting will establish the position corrections for the Met+VE technique.**
- **Corrections for rocket motor temperature (Table E.1) must be used.**
- **Or, using Subsequent Met technique an inferred GFT setting may also be computed**
- **Or, using Subsequent Met (Met + VE technique) determine a inferred GFT setting using the Position Constant values as Zero.**
- **ROF**

# Manual Special Munitions

# QUICK SMOKE
# Page 13-23

# Manual Special Munitions

## SMOKE PROJECTILES

- **The Field Artillery currently possesses three types of smoke projectiles.**
- **M116A1 Hexachloroethane (HC)**
- **These projectiles are available for the 105mm and 155mm howitzers.**
- **Used for screening, spotting and signaling purposes. The projectile has no casualty producing effects.**
- **This base ejection projectile is ballistically similar to the M107 HE (155mm)and M1(105mm) projectiles.**
- **Uses a mechanical time fuze, M565 or M577.**
- **Expels smoke canisters that emit smoke for a period of 40 to 90 seconds.**

# Manual Special Munitions

- **M825 White Phosphorus (Felt-Wedge)**
- **A 155mm base ejection projectile designed to produce a smoke screen on the ground for a duration of 5 to 15 minutes.**
- **It consists of two major components, the projectile carrier, and the payload.**
- **The projectile carrier delivers the payload to the target.**
- **The payload consists of 116 WP-saturated felt wedges.**
- **After ejection, the WP felt wedges fall to ground in a elliptical pattern. Each wedge will then becomes a source of smoke.**
- **The projectile is ballistically similar to the M483A1 DPICM family of projectiles.**

# Manual Special Munitions

- **M110/M110A1 White Phosphorus (WP)**
- **These projectiles are available for 105mm and 155mm howitzers.**
- **Used for screening, spotting and signaling purposes.**
- **Has an additional incendiary effect on a target and processes casualty producing effects.**
- **This burster-tube type projectile is ballistically similar to the M107 HE (155mm)and M1(105mm) projectiles.**
- **It can be fitted with a mechanical time Super Quick fuze M582 or M557/M739 PD fuze.**

# Manual Special Munitions

## SMOKE EMPLOYMENT

- **The Field Artillery employment of smoke is based upon two delivery techniques.**
- **Quick Smoke or Immediate Smoke.**
- **The sources for 155mm firing data are:**
- **M110A1 WP - FT 155-AM-2 w/Ch 2 and corresponding GFT's**
- **M116 HC - FT 155-AM-2 w/Ch 2 and corresponding GFT's**
- **M825 WP - FT 155-AN-2 w/FT-ADD-Q- 0**
  **- FT 155-AM-2 w/Ch 2 and FTADD-T- 1**

- **There are 155mm AM-2 GFT's available that have M825 secondary scales in place of the ICM scales.**
- **However these GFT's are not valid due to current FDC procedures.**

# Manual Special Munitions

## Immediate Smoke

- **Designed to build a immediate screen on a point or small area target of 150 meters or less.**
- **Utilizes a normal time limit of 5 to 30 minutes in duration.**
- **Immediate smoke is normally fired using a parallel sheaf as a separate mission, or as a follow up to an immediate suppression mission.**
- **The initial volley may be fired with shell WP, or a mix of shells WP and shell HC.**
- **When firing the M825 projectile all howitzers should fire M825 in the initial and subsequent volleys.**
- **Your unit SOP should dictate the number of volleys and which howitzers will fire WP and which will fire HC if applicable.**

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## Quick Smoke

- **Used to build a screen 100 to 1500 meters in length, depending on the projectile selected.**
- **It may be fire as a pre-planned target or target of opportunity.**
- **Targets that are exceed the battery sheaf sizes in length should be pre-planned, due to ammunition constraints and the possible need to segment the target.**
- **May be processed as an Adjust Fire or Fire For Effect mission.**
- **Accurate mission processing on pre-planned targets, in addition to meeting the five requirements for accurate predicted fire, pre-supposes a positive correlation between wind direction at the screen location and what is listed on line 00 of the current met message.**

# Manual Special Munitions

## Quick Smoke Procedures

- **Fired using Linear Sheaf's, TGPC's or Special Corrections.**
- **Based on the atmosphere conditions and the type of smoke desired, the FDC may need to determine two sets of firing data.**

- **One for the initial volley and one additional set for subsequent volleys.**

- **The initial volley is to establish the screen, and the subsequent volleys are to ensure that the smoke screen is in place for the desired duration requested or given in MTO.**

# Manual Special Munitions

## Quick Smoke Procedures Addition Information

- **In order for the FDC to provide an effective smoke screen, the FDC needs to obtain additional information not normally provided for in other missions or Call For Fires.**
- **From the observer, the FDC will need in addition to the target location certain engagement information.**
- **The acronym- LMDIRT - is used as a memory aid to report this engagement information when needed:**
- **L = Length**
- **M = Maneuver Target Direction**
- **DIR = Wind Direction (Head, Tail, or Cross Wind)**
- **T = Time Desired**

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## Observers Addition Information

## The acronym- LMDIRT

- From the center location of desired smoke screen a FDC will compute the offset aim-points based on the type of ammunition, wind speed and/or wind direction.
- L = The desired length of the smoke screen.
- M = The maneuver target direction. (The direction from which the maneuver element will be the most susceptible to enemy observation to the center location of the smoke screen).
- DIR = Wind direction at the target in reference to the maneuver target line.
- T = The screen time (duration) desired in minutes, and Screen requirements. Example: The observer must let the FDC know the type of screen required, visible or infrared (visible is the standard if infrared not requested).

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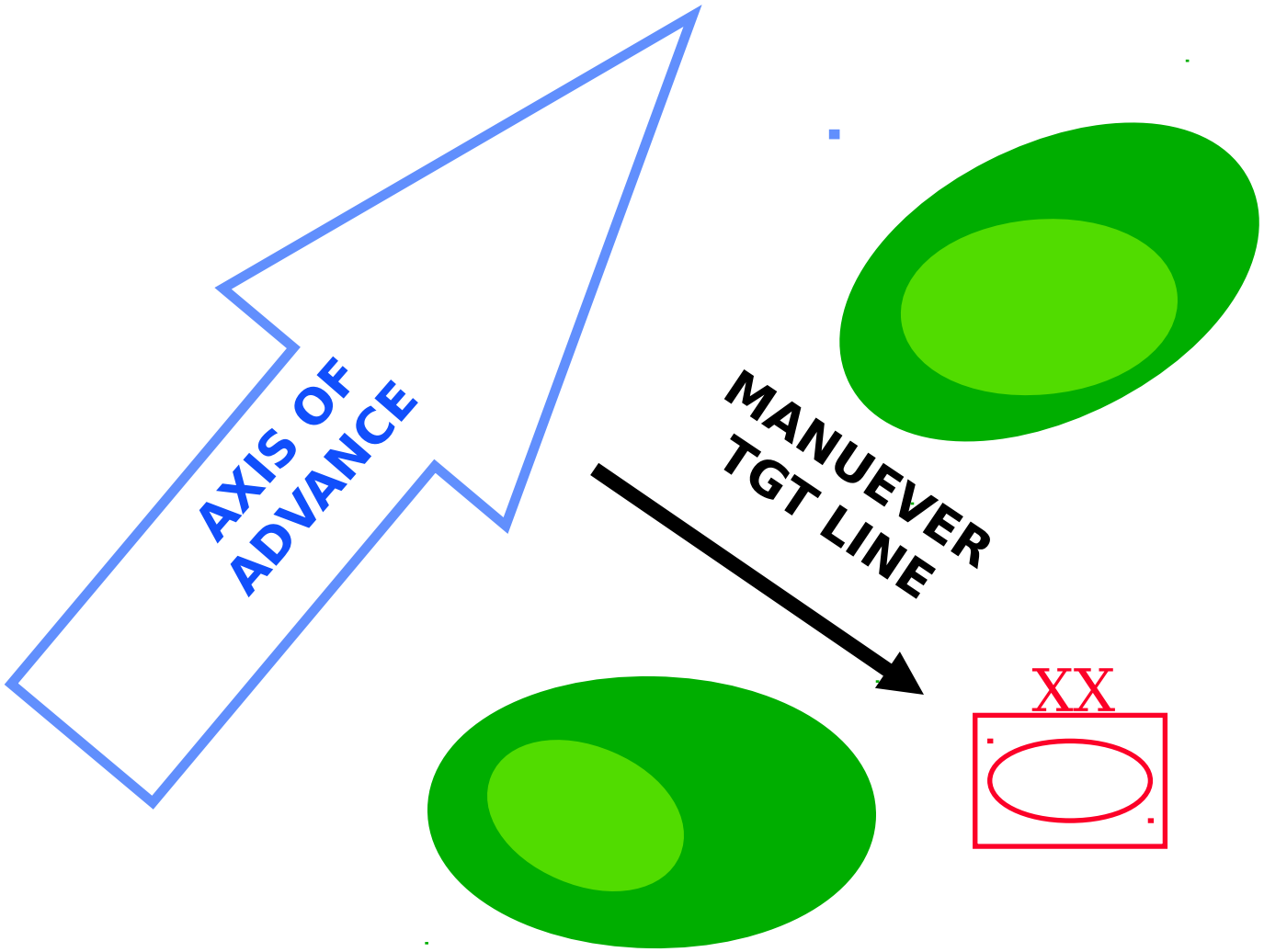
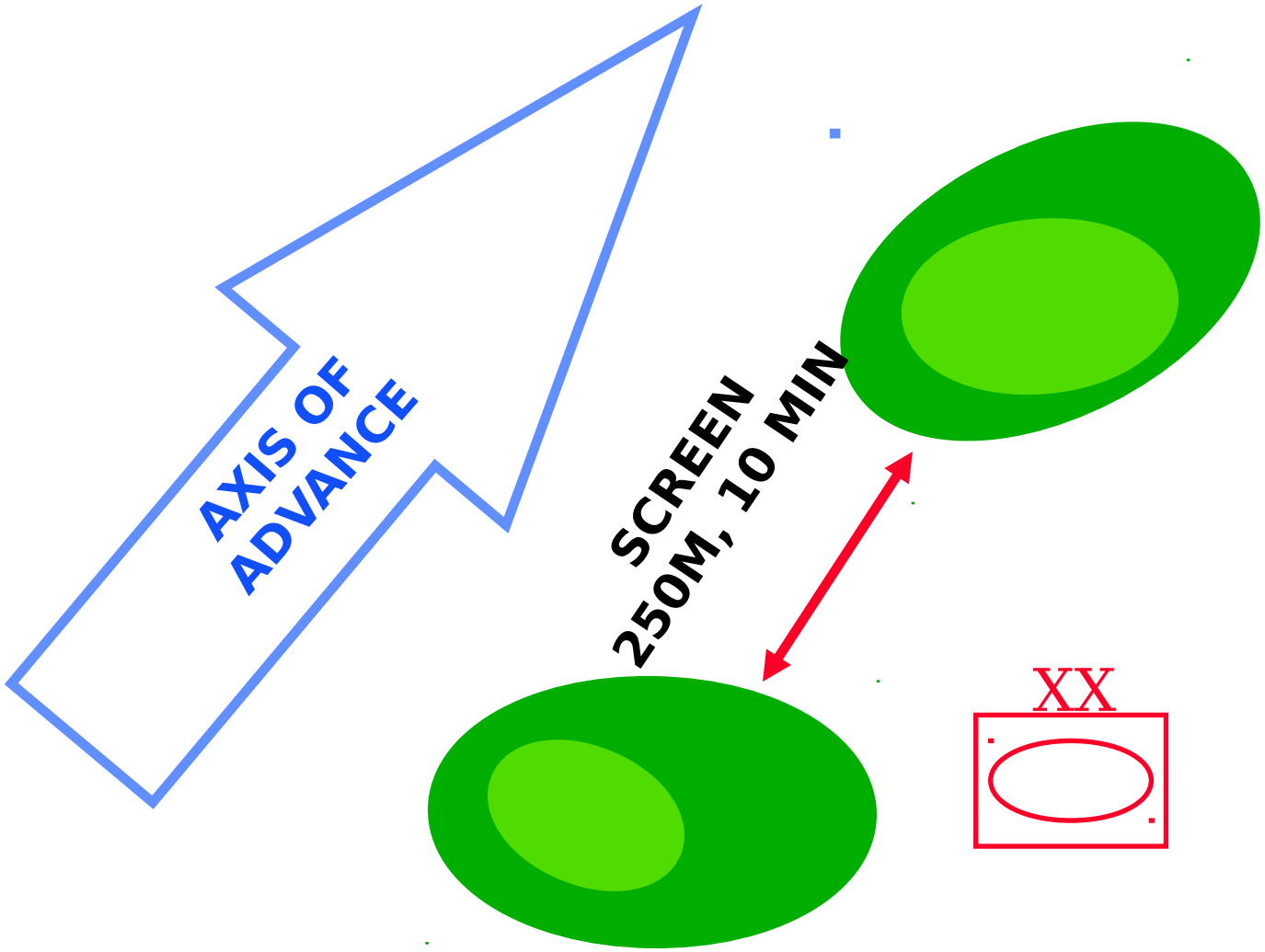


# Manual Special Munitions



# Manual Special Munitions

## Addition Information

- From the MET station, the FDC will need the relative humidity for line 00 of the latest Met message.
- The relative humidity is not part of the met message. It must be asked for specifically from the met station, or announced as a unit's SOP at the conclusion of the met broadcast.
- From the current met message, the OPS Chief will extracts the wind speed and temperature from Line 00.
- When the call for fire is received, the OPS Chief will use a series of Smoke Tables contained in the FM 6-40, Appendix I, to determine additional FDC information.
- ROF

Manual Special Munitions

# M712
# COPPERHEAD

# Manual Special Munitions

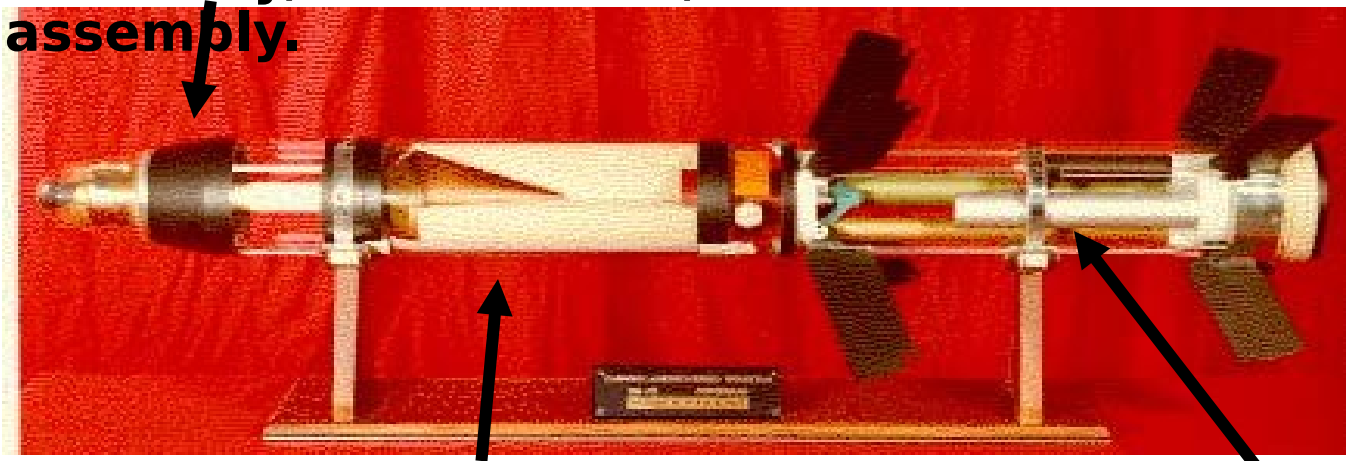
## M712 COPPERHEAD

- **A Cannon-Launched, Laser-Guided, High Explosive projectile.**
- **Only in 155mm and is a separate loading projectile that consists of three main sections.**
- **Shipped and stored in a sealed container that requires no assembly or testing at the firing site.**
- **Weighs 137.6 pounds and is 54 inches long.**

# Manual Special Munitions

## Copperhead's Three Main Sections

**Guidance section - contains the seeker head assembly, laser seeker, and the electronics assembly.**



**Warhead section - contains a high explosive anti-tank warhead that has a 14.75 pound Composition B Shaped Charge.**

**Control section - includes the fins and wings which deploy in flight and allow the projectile a limited maneuverability.**

# COPPERHEAD TRAJECTORY

- **The trajectory of the Copperhead projectile is similar to that of a conventional projectile until it reaches a point on the descending branch of the trajectory.**

- **At that point the guidance and control systems are activated by the Switch Setting included in the fire commands.**

- **The projectile is then able to alter the remainder of it's trajectory.**

# Switch Settings

- These Switch Settings have five digits.
- The first two numbers are the Time Setting determined by the FDC.
- The first digit programs the projectile for a specific trajectory. (A 1 or 2 results in ballistic trajectory, 3 - 8 will result in a shaped trajectory)
- The second digit programs a time delay based on the duration of flight and type of trajectory. ( 1- 8 will result in a delay of 0 - 45 seconds for ballistic mode and 0 - 48 seconds for a shaped trajectory)
- The last three digits are the Pulse Repetition Frequency (PRF) Code and it establishes a common laser frequency between the projectile and the observer.

# Copperhead Target Area Actions

- **Twenty seconds before impact, the FDC cues the Observer with Laser On, telling the observer to begin to designate the target.**
- **The Copperhead projectile will acquire the reflected laser energy and initiate its internal guidance and control, allowing the projectile to maneuver to the target.**
- **However, the ground surface area in which the projectile can maneuver is limited.**
- **The optimum limits of maneuverability of a Copperhead projectile is called a footprint.**
- **The Copperhead can compensate for errors in range easier than it can for an error in deflection and should not be fired when the Angle T is greater than 800 mils.**

# Manual Special Munitions

## Copperhead footprint.

- **The size of the footprint is determined by the gun-target range, the shape of the trajectory, and can also be affected by cloud height.**
- **Utilizes a ballistic aiming point located on the gun-target line, usually short of the of the location sent by the Observer.**
- **The distance that the ballistic aim point, or the offset correction, is short of the target location varies.**
- **This offset distance is used to ensure that the maximum probability of a target hit will occur at the original target location sent by the observer.**
- **The larger the target location error, the lower the probability of hitting the target.**

# COPPERHEAD MISSIONS

- Copperhead missions can be fired on planned targets or targets of opportunity.
- Planned targets can be a priority targets or on-call targets.
- Planned Targets - Because of it's relatively short response time, the planned target is the preferred method for employing Copperhead.
- Unless specified on the target list, two Copperhead projectiles are prepared in advance for each Copperhead priority target.
- DA Form 5711-R (Copperhead Planned Target List Worksheet) may be used to quickly update data for a planned Copperhead Target.
- The data is then transferred to a DA Form 4504 (ROF) when fired.
- The Firing data for planned targets are based on the solving of a met to target with the Copperhead TFT (FT 155-AS-1).

# On call Target Procedures

- **The same as for any conventional on call mission. The following procedures may be used to increase the response time for determining the firing data on targets of opportunity.**
- **Due to the decreased response time the solving of a met to target for each target is impractical.**
- **Select charge(s) to cover the area of operations.**
- **Base the decision also on expected cloud height and visibility.**
- **Solve a Met + VE for the selected Charge(s) using the center grid of the range interval for that charge.**
- **Ensure that at least two howitzers and two rounds are prepared for any given mission. This increases the firing unit responsiveness if a projectile or a howitzer malfunctions.**
- **Table 13-1 Copperhead Projectile Selection Table provides doctrine for selection of number of howitzers and projectiles for any given target strength up to six elements.**

# When a Met to Target is Solved

- **Apply the following guidelines:**
- **Use a Position Deflection correction of ZERO unless it is known.**
- **Use Muzzle Velocity calibration data determined from the M94 and corrected for non-standard conditions for the Position VE.**
- **If M94 data is not available - determine the loss in muzzle velocity (MVV) from a recent pullover gauge reading and / or from the EFC rounds, and use for the Position VE.**
- **No fuze setting corrections are determined.**
- **Use the total range correction determined as "Range K" and apply to all other missions using that charge.**
- **When the observer requests a Copperhead target of opportunity, apply the Range K to the chart range to determine the entry argument for Table F, Column 1.**

# Manual Special Munitions

# COMPUTATIONS FOR SHELL COPPERHEAD

- **The Copperhead projectile travels in a trajectory determined by the switch setting.**
- **That trajectory used is dependent on the chart range to the target, observer visibility, and target cloud height. (Shaped Trajectory or Ballistic Trajectory)**
- **The TF 155-AS-1 contains the data for the Copperhead projectile.**
- **There are no GFT's for AS-1.**
- **The targeting logic used in the FT 155-AS-1 allows the FDC to select one of the two trajectories for the manual computation of firing data.**

# Ballistic Trajectory

- **Has a greater angle of fall, which results in a greater target area effect.**
- **In the Ballistic mode the projectile travels in a ballistic trajectory that is only affected near the end of the descending branch when the projectile acquires and hones in on the reflected laser energy.**
- **The steep angle of fall generated by a ballistic solution limits the time available for the projectile to acquire the laser energy after exiting the cloud cover.**
- **If the projectile fails to acquire the designator, the projectile will continue to follow the trajectory to the ballistic aim-point.**

- **As covered the ballistic aim-point is the point to which firing data has been computed, it is usually offset along the gun-target line by 0 to 500 meters.**

# Shaped Trajectory

- **Because the steep angle of fall generated by a ballistic solution limits the time available for the projectile to acquire the laser energy, the use of the Shaped Trajectory allows the projectile to approach the target at a shallow angle and thus stay below the cloud cover.**
- **Causing the projectile to glide at a constant angle in the descending branch of the trajectory, allowing longer exposure to the reflected laser energy and thereby enhancing acquisition probability.**
- **However, a true glide mode is only achieved when computing data using FT 155-AS-0 or GFT 155mm AS-0. (page 13-1)**

- **ROF**

# Family of Scatterable Mines (FASCAM) Page 13-46

# Family of Scatterable Mines (FASCAM)

- **A new dimension in mine warfare and gives the maneuver commander an array of artillery delivered mines.**
- **Can provides a rapid and flexible means of delaying, harassing, paralyzing, canalizing, or wearing down the enemy forces in both offensive and defensive operations by:**
- **Forcing the enemy into kill zones or make them change their direction of attack.**
- **Spend time in clearing operations, or take evasive actions.**

- **There are two types of Field Artillery delivered mines.**

# Manual Special Munitions

## TYPES OF FASCAM PROJECTILES

- **ADAM (Area Denial Artillery Munitions)**
- **An anti-personnel mine activated by deployed trip-lines.**
- **36 (4 by 9 high) wedge shaped mines are fitted into the projectile.**
- **The mines are ejected from the projectile over the target.**
- **Shortly after ground impact the seven trip-line sensors are released out to a maximum length of twenty feet.**
- **The detonators are armed to function in the event of any small disturbance.**
- **A liquid propellant settles to the bottom of the mine ensuring that once the mine detonates the kill mechanism will be propelled 3-8 feet upward before detonating into fragments.**
- **The ADAM mine is lethal out to 15 feet (5 Meters).**
- **2% of the mines are equipped with anti-disturbance devices.**

# Manual Special Munitions

- **RAAMS (Remote Anti-Armor Mine System) is effective against armored vehicles.**
- **The mines are ejected from the projectile over the target.**
- **There are 9 RAAM mines per 155-mm projectile.**
- **Two of the RAAMS are equipped with an anti-disturbance device.**
- **After ground impact and roll, the mine is armed and ready to detonate.**
- **Senses the armored vehicle's (electromagnetic) signature.**
- **To detonate, the signature must pass over the top of the mine.**
- **The RAAMS mine will function right side up or upside down; where the least amount of pressure is.**
- **Additionally, it will function properly on cants of less than or equal to thirty degrees. For cants greater than 30 degrees, a mobility kill can be expected.**

# FASCAM Tactical Information

- **The mines will detonate when the battery voltage drops to a level which impairs function or a pre-designated self-destruction time.**
- **Self-destruction times are 4 hours for short duration, and 48 hours for long duration.**
- **A Minefield's density can be selectively determined by the altering the altitude of ejection, or the number of rounds applied.**
- **There are currently 3 densities: Low, Medium, and High.**
- **RAAMS is highly effective when used in conjunction with the ADAM mine, which assists in the prevention of the RAAMS from being neutralized by ground troops.**
- **However, the RAAMS must be fired first. It's heavier sub-munitions will activate the ADAM sub-munitions.**
- **Low-level winds can cause the ADAM sub-munitions to be blown away from the intended aim-points, so a modification (Offset) must be made to it so that the mines impact at the intended location.**
- **Both ADAM and RAAMS have a 4.5% dud rate.**

# Three Roles FASCAM is Used For

- As a delivery system for planned minefields in support of the barrier or obstacle plan.
- To establish a minefield in front of or on top of, targets of opportunity.
- As a harassing weapon in conjunction with other munitions such as, DPICM, Smoke, and HE, during the attack of a target.
- The use of or Request for use of all mines requires detailed coordination and approval with the G3/S3, the Engineer Officer, in conjunction with the Fire Support Coordinator.

# Planned Minefields

- **Planned minefields begin with the development of the scheme of maneuver and the barrier/obstacle plan by the G3/S3 and engineer officer.**

- **Prior to making a decision on the employment of ADAM/RAAMS, the Fire Support Coordinator is brought to the planning process to provide guidance on the availability of FA mines and delivery units.**

- **The process is then initiated with the Minefield Planning Sheet (DA Form 5032-R).**

# Minefield Planning Sheet (DA Form 5032-R).

- **The Fire Support Coordinator completes Section A-Minefield Data. (This section includes basic information about the mission necessary for issuing a fire order and computing data.)**
- **Section B-G3/S3/ENGR: is completed by the Operations Center.**

  **(The G3/S3 responsibility is for all barrier/obstacle plans.) The engineer officer will provide the technical expertise in the preparation of the obstacle plan.**
- **The FSC provides the execution expertise.**
- **Modifications to Section A are made as appropriate.**
- **The FSO from the requesting unit(s) completes Section C-FSE/FSO.**
- **The FDO of the firing unit will complete Section D- FDC DATA.**
- **Once Completed by the FDC, DA Form 5032-R is forwarded to the FSO.**

# Minefields Against Targets of Opportunity.

- **Minefields employed against targets of opportunity (unplanned) must be emplaced immediately because of the tactical nature of the targets.**
- **FASCAMS missions can be requested through the Fire Support Channels at any level.**
- **There are a number of tactical considerations to be taken into account when determining which firing unit(s) will deliver the mines on target.**
- **How many firing units are available with similar BMA's. How the aim-points will be distributed among the firing units, guns etc. (PAGE 13- 56)**
- **Once the maneuver commander has approved the use of FA mines, they may be emplaced appropriately.**
- **Normally, targets of opportunity are used when the delivery can be observed.**

# FDC Computation Procedures

- Upon receiving a request for a FASCAM minefield:
- The Battery Minefield Angle (BMA), angle of fire, number of aim-points, and the desired minefield density must be determined.
- Technical fire direction must be determined by using the DPICM graze burst data (FT155-AN-2) and then converting this DPICM data to either RAAMS or ADAM data.
- FT 155 ADD-L-1 (ADAM)
- FT 155 ADD-N-I (RAAMS)
- The preferred technique is to conduct a DPICM registration and transfer the GFT setting.
- Other techniques utilized are MET + VE or MET to Target.

# Manual Special Munitions

# FDC Computation STEPS

- **Three questions must be asked to determine the appropriate mine employment table to utilize:**
- **What delivery technique am I using? - Transfer or MET + VE or Observer Adjust.**
- **What shell and trajectory will I fire?**
- **- (RAAMS) low angle / high angle.**
- **- (ADAM) low or high angle.**
- **What is the BMA? (Defined as the smaller interior angle formed by the intersection of the minefield centerline with a line drawn from the battery center to the center point of the minefield). BMA is <u>always</u> less than 1600 mils.**
- **- Less than or equal to 800 mils or greater than 800 mils.**
- **A table number will be used for each of the three-entry arguments for the mine employment.**

# Planning Modules

- **The trajectory will make a difference in the minefield module you used.**

- **RAAMS - low angle planning module: 200 x 200.**
- **RAAMS - high angle planning module: 400 x 400.**
- **ADAM - low or high angle planning module: 400 x 400.**

- **If ADAM and RAAMS are employed together:**
- **The process for determination of the appropriate mine employment table is accomplished for each projectile.**

# Manual Special Munitions

## Use of Tables

- **Review the header information to verify the appropriate table is being utilized. The entry argument is the Length (greatest axis).**
- **Chart range is used to enter along the left side of the table: closest listed value.**
- **(Note) If the chart range falls exactly halfway between two ranges, use the lower listed range.**
- **Determine aim-point spacing based on the module size and the number of aim-points.**
- **Enter Table 13-21 with the desired density: determine the number of rounds necessary to achieve that density. (Realize however, there will be rounds outside the planning module but the desired density will still be achieved.**
- **A density of .001 means that there will be one mine every 1000 square meters. (one mine every 32 x 32 meter area.)**
- **ROF**

# Manual Special Munitions

# QUESTIONS????

- **5**
- **4**
- **3**
- **With the vast numbers of enemy forces on battlefield SPECIAL MUNITIONS are a viable weapon that provides for rapid employment and flexibility to defeat the enemies armor and combat numerically superior forces. By the use of force multiplier munitions artillery could mean the difference between the long range battle or the infantry close in battle.**